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Puzey

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(54) **VARIABLE REFLECTIVITY MIRROR FOR INCREASING AVAILABLE OUTPUT POWER OF A LASER**

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(58) **Field of Search** 372/99, 92, 96, 372/46, 55, 53

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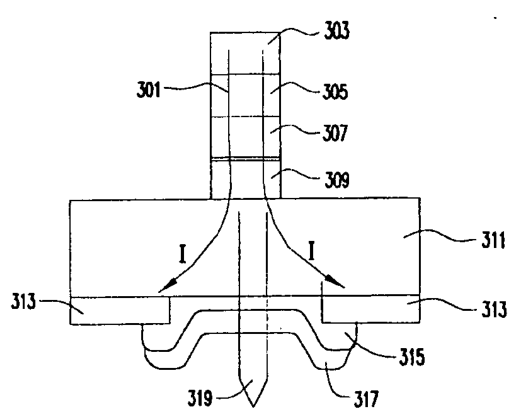
(57) **ABSTRACT**

Output for a laser is greatly increased by altering the transmitivity of a superconductor layer which serves as one of the mirrors of the laser cavity. The superconductor layer is switched between a superconductive state, having reflectivity of one, and a non-superconductive state, having a reflectivity of less than one. When the mirror is in its superconducting state, output power is decreased and power in the cavity is increased, and when the mirror is in its non-superconducting state, output power of the laser is increased and power in the cavity decreases.

42 Claims, 6 Drawing Sheets



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TITLE: Variable reflectivity mirror for increasing available output power of a laser

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Detailed Description Text - DETX (27):

In order for the superconductor to work properly as a mirror the photon energy must not be greater than the band gap of the superconductor. Therefore gain media for low photon energy are particularly useful in the present invention. Such gain media include lead salts and Quantum Cascade structures. Quantum Cascade structures use bandgap engineering techniques to allow common semiconductor materials to emit lower energy photons than were previously possible. Quantum Cascade structures are described in L. J. Olafsen et al. "Near-room-temperature mid-**infrared** interband cascade laser," Applied Physics Letters, vol. 72, no. 19, May 11, 1998, pages 2370-2372; J. Faist et al. "Short wavelength (lambda.about.2.4 microns) **quantum cascade laser** based on strained compensated InGaAs/AlInAs," Applied Physics Letter, vol. 72, no. 6, Feb. 9, 1998, pages 680-682; and J. Garcia et al. "Epitaxially stacked lasers with Esaki junctions: A bipolar cascade laser," Applied Physics Letters, vol. 71, no. 26, Dec. 29, 1997, pages 3752-3754. An antireflection coating can be deposited on the end-face of a quantum cascade laser using chemical vapor deposition, plasma arc deposition or other commonly practiced methods. Then superconducting mirrors can be used to form an external

Fabry-Perot cavity
around the Quantum cascade gain medium.